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EXAMPLE 9

Direct Loading of ClO_2 Gas into Particles

Tap water was absorbed into polyacrylic acid and polyacrylamide copolymer particles. The particles were then exposed to chlorine dioxide vapors, generated in a separate container, by the reaction of aqueous solutions of sodium chlorite and hydrochloric acid. The polymer particles became yellow in color indicating chlorine dioxide gas solubility in the particles. Particles were stable for many months.

EXAMPLE 10

Delivery of ClO_2 and Uptake of Heavy Metals

Chlorine dioxide gas containing particles prepared in Example 4 were transferred into a small volume of aqueous solution containing copper ion. Upon transfer of the particles, the solution turned yellowish green. Additionally, the polymer particles turned green-blue in color indicating adsorption of copper ions by the polymer. This example provides an example of simultaneous gas delivery to a solution and heavy metal uptake by the polymer. This material characteristic is beneficial in many water treatment and purification applications.

EXAMPLE 11

 ClO_2 Precursor Storage and Boric Acid

Sodium chlorite solution was absorbed into dry sodium hydroxide containing polyacrylic and polyacrylamide containing polymer particles. The hydroxide containing particles were previously prepared by absorbing a concentrated sodium hydroxide solution and drying. The solution pH of the chlorite containing particles was highly alkaline ($\text{pH} > 10$). The particles were then placed in a sealed plastic bag. The particles were stable and uncolored. When several particles were exposed to tap water acidified with boric acid, the solution immediately became yellow in color.

EXAMPLE 12

Electrochemical Generation of ClO_2

A sodium chlorite particulate material was prepared with tap water and polyacrylic acid particles and polyacrylamide copolymer particles. The particles were then placed in a single container that also contained two platinum electrodes connected to a DC power source (type C battery). Shortly after connecting the power supply, the polymer particles became green-yellow in color and a chlorine odor was detected above the container. This example indicates that the polymer particles containing solutions of chlorite can undergo direct electrochemical reaction to produce chlorine dioxide gas, which is both retained and released by the polymer particles. Those skilled in the art of electrochemical devices will understand that AC, solar, or other power sources are likewise suitable for use with the materials.

EXAMPLE 13

Secondary Solution Preparation

A solution of chlorine dioxide was prepared by mixing hydrochloric acid with sodium chlorite in tap water. After formation of a yellow colored solution with a strong chlorine odor, polyacrylic acid and polyacrylamide copolymer par-

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ticles were introduced. The particles rapidly absorbed the solution containing dissolved chlorine dioxide gas. The particles were stable and retained the yellow color for many weeks. When 5-10 individual particles were transferred to a one liter container of water, the chlorine dioxide concentration was determined to be approximately 1 ppm, using a DPD chlorine test kit.

EXAMPLE 14

Polycarbonate Storage Materials

A solution of chlorine dioxide, yellow in color, was prepared by mixing aqueous solutions of chlorite and hydrochloric acid. This solution was used to fill a transparent polycarbonate container. The container was sealed and stored for several days. After removing the chlorine dioxide solution, the polycarbonate container retained a yellow color. The empty container was placed in a refrigerator with an unpleasant odor. After several minutes the unpleasant odor was no longer detected. The polycarbonate container slowly lost all yellow color over a period of weeks when exposed to the atmosphere.

Publications cited herein and the materials for which they are cited are specifically incorporated by reference. Modifications and variations of the methods and devices described herein will be obvious to those skilled in the art from the foregoing detailed description. Such modifications and variations are intended to come within the scope of the appended claims.

I claim:

1. A composition for use in containing and releasing a reactive gas comprising:

a reactive gas, reactive gas precursor, or combination thereof, wherein the reactive gas precursor comprises an oxidizing agent selected from the group consisting of hypochlorite, hypochlorous acid, ozone, peroxide, and monopersulfate;

a fluid in which the reactive gas, reactive gas precursor, or combination thereof is dissolved; and

a solid material in which the fluid is absorbed or adsorbed, wherein the solid material controls the formation or release of the reactive gas.

2. A composition for use in containing and releasing a reactive gas comprising:

a reactive gas, reactive gas precursor, or combination thereof;

a fluid in which the reactive gas, reactive gas precursor, or combination thereof is dissolved, wherein the fluid comprises a non-polar liquid; and

a solid material in which fluid is absorbed or adsorbed, wherein the solid material controls the formation or release of the reactive gas.

3. A composition for use in containing and releasing a reactive gas comprising:

a reactive gas, reactive gas precursor, or combination thereof;

a fluid in which the reactive gas, reactive gas precursor, or combination thereof is dissolved;

a first solid material in which the fluid is absorbed or adsorbed; and

a second solid material in which an acid is absorbed, wherein the first or second solid material comprises an acid polymer selected from the group consisting of polylactic acids, polyglycolic acids, polyacrylic acids, polyacrylamides, polyesters, polyhydroxyls, polyalcohols, polyanhydrides, and gums,